

MATSOL 2019 Conference

Teaching Patterns of Critical Thinking

3CA model:

Concept map, Critical Thinking, Collaboration and Assessment

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Components of the 3CA model

First C: Concept Map

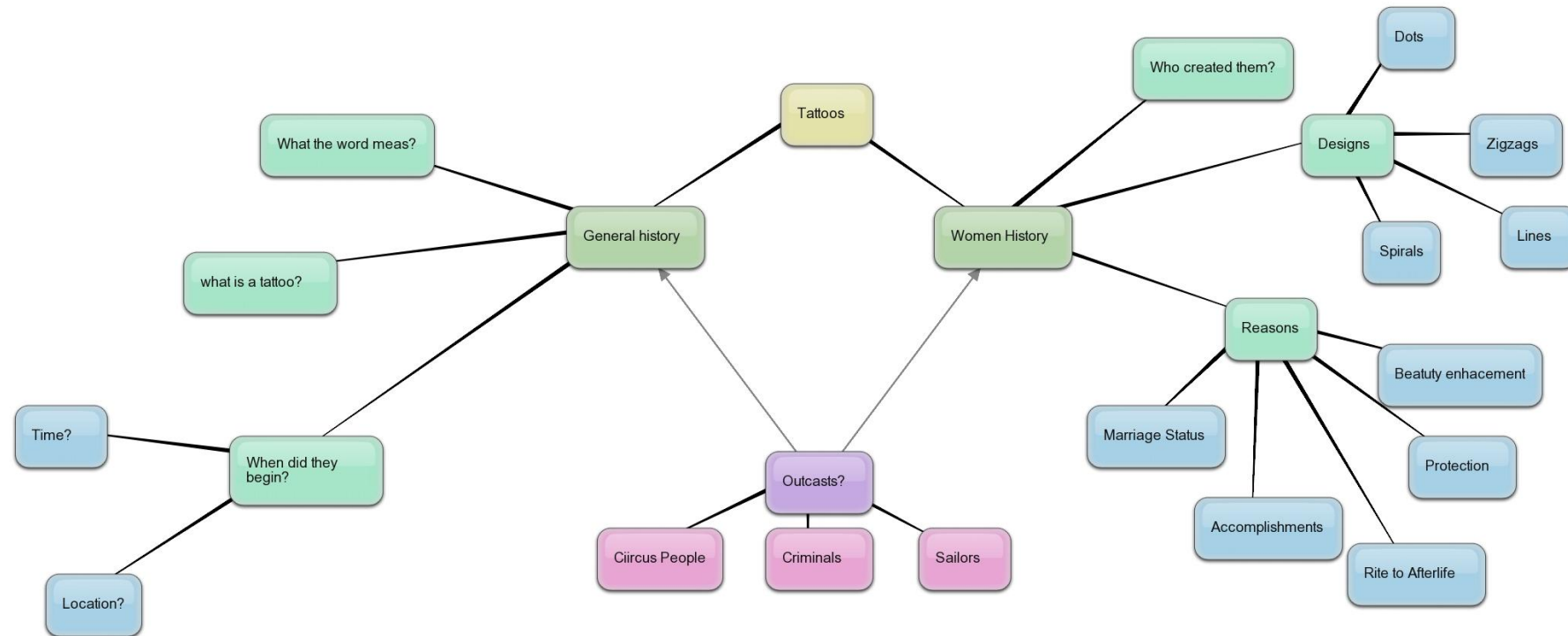
Second C: Critical Thinking

Third C: Collaboration

A: Assessment

Concept map:

Visual representation of written texts/concepts/thoughts, ideas



Critical Thinking in 3CA model

Aristotle's approach



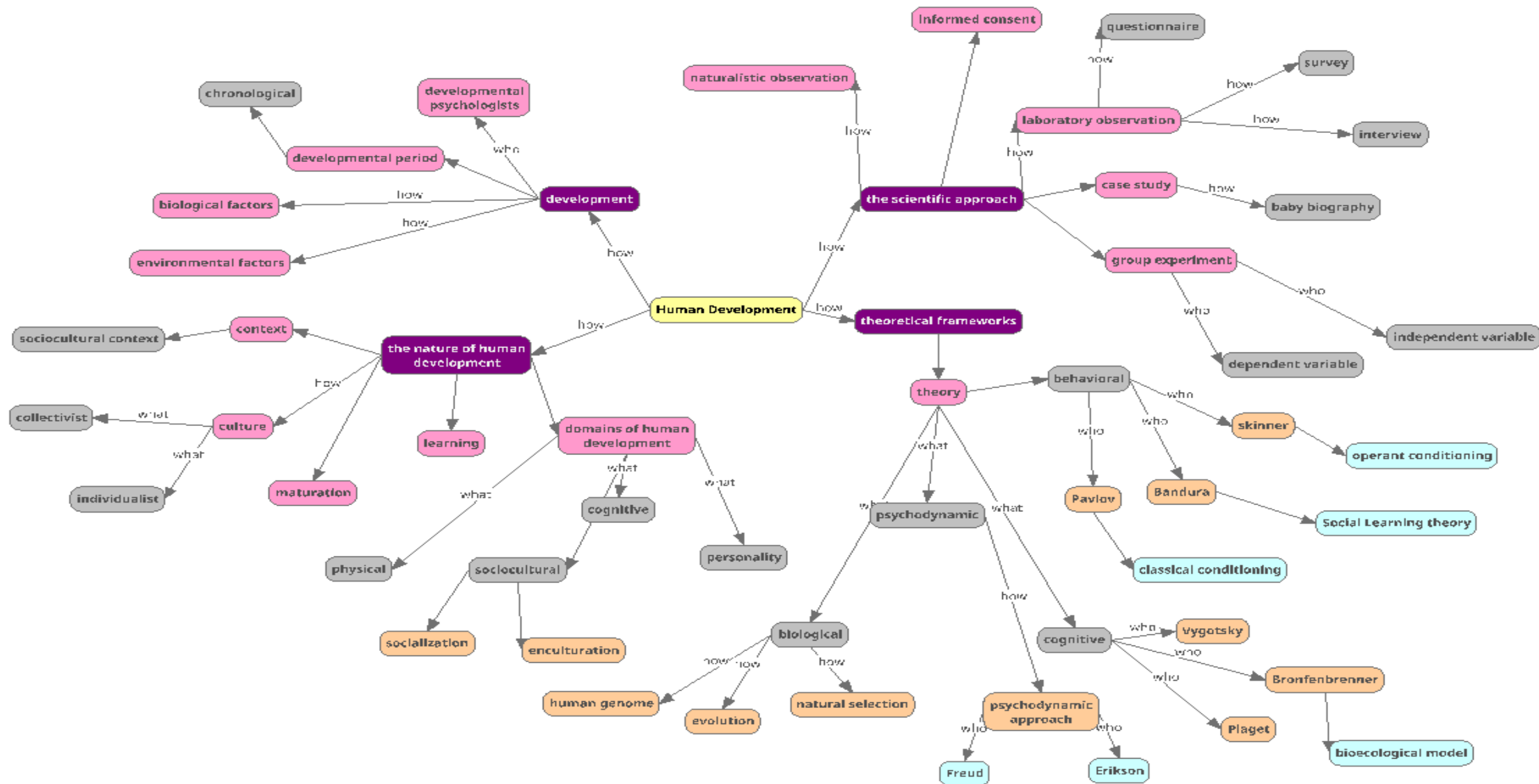
Application of WH questions:



(what , when , where, how, why, who,) to different concept, key terms,...



Critical Thinking-Concept Map: Connection among concepts with WH questions



Collaboration



- The Third C in the 3CA model and stands for collaboration (working together/ sharing and creating of the critical thinking concept maps)
- In their review of the psychological and cognitive science literature, Andrews and Rapp (2015) make clear that collaboration has its own unique benefits, costs, and challenges

“A” in 3CA model : Assessment reconsidered:

- New approach to assessment
- Students create the items out of their critical-thinking concept maps for their own assessments
- A change in the hierarchical power in assessment
- The reduction of student stress, and the construction of items/questions as tools for equity in the assessment process.

Practicum Part



Individual Phase

Collaborative
phase

Individual phase

1-Hand- written critical thinking- concept map

- ▶ While you are reading the text, please generate a hand-written concept map which means converting text/your ideas about the text into a map based on your thinking.
- ▶ Please don't forget to connect the concepts in your maps with WH questions(what, when, where, how, who, why).
- ▶ Please keep in mind that your map can be completely different from each other because your way of thinking is unique and different.

2- Generate 2 questions based on the map

- ▶ Please generate 2 questions using the critical thinking questions in your maps(what, when, why, how, where, who).
- ▶ The questions can be designed in different forms (Open-ended questions, multiple choice, fill in the blank,...)

Collaborative Phase

3- Determine a partner to share your map with

Synthesis



6- Social/Cognitive synthesis: Share your individual concept maps(feedback provision)/ask the questions from each other/and generate a new collaborative map

- ▶ At this stage you share and explain about your individual map . You talk not only about the reasons and logics behind the concepts you chose to use in your maps but also about the connections among them.
- ▶ You discover the gaps in each other's map which is the the picture of your thinking.

9- Please generate a new collaborative map based on the information you gathered from each other

After generating a new collaborative map,
Generate two questions collaboratively.

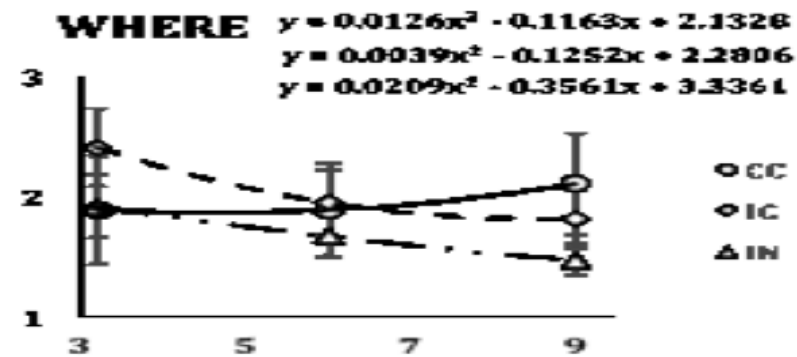
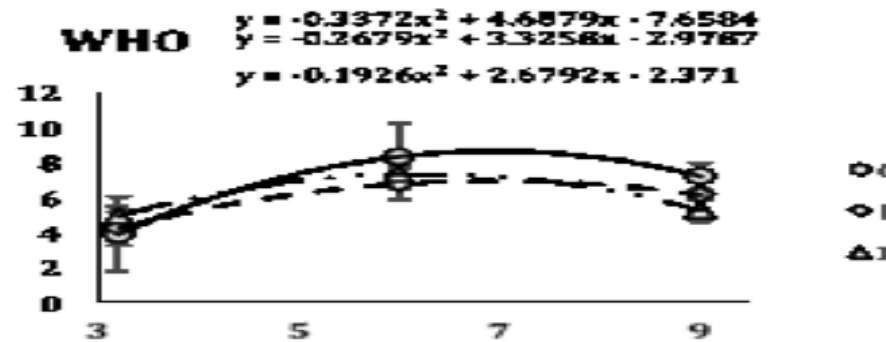
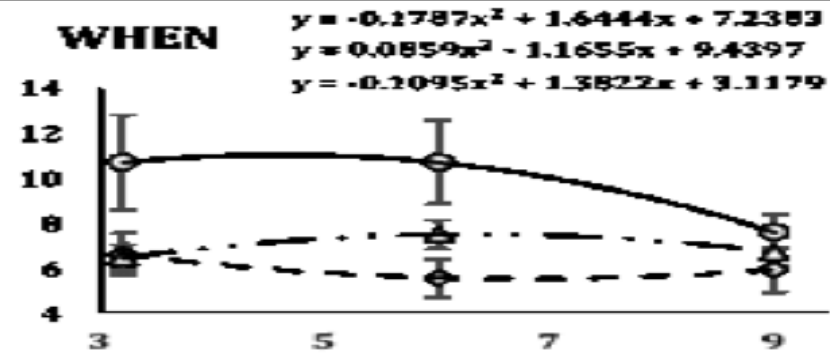
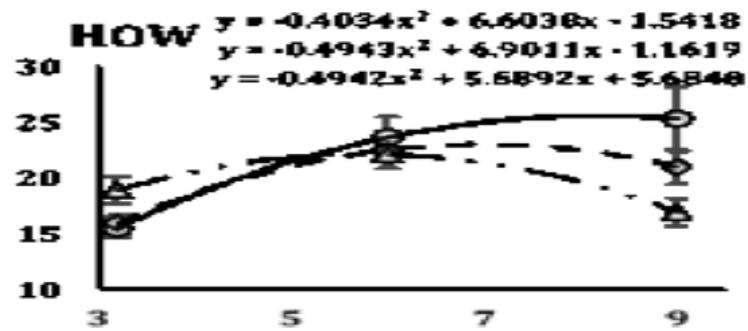
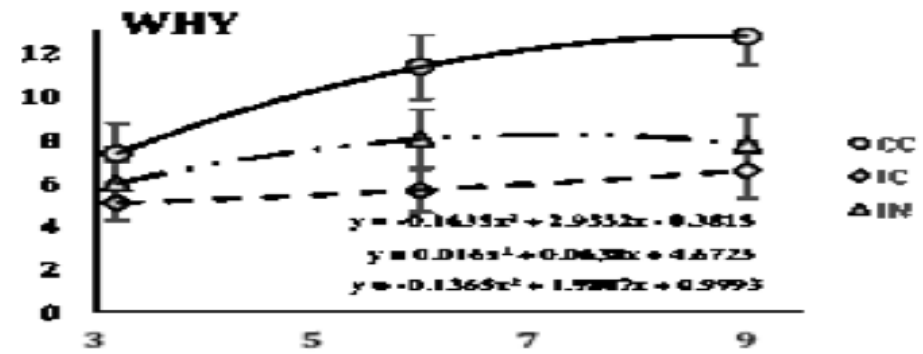
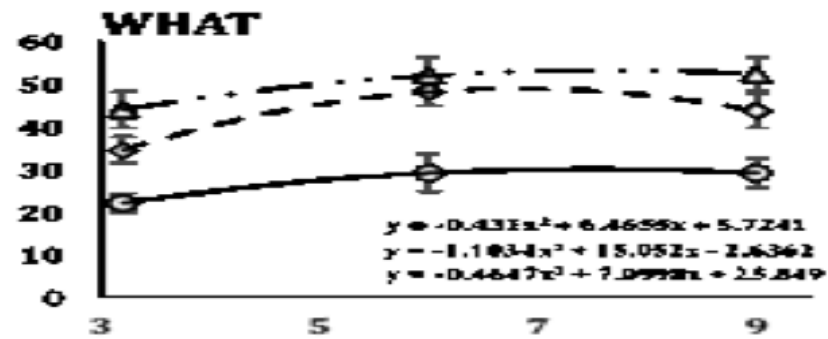
Peer-self assessment

Ask and answer the 4 questions
(2 individual questions/2 collaborative questions)
and discuss the answers

You can give feedback to each other and revise each other's questions.

11-Choose another partner and share your questions with

- ▶ Please ask and answer the questions from each other



Implication

- ▶ Teaching critical thinking skills in a college classroom / replication .
The insight that the CTQ of Aristotle's WHs are the elements of critical thinking is a conceptual advance in defining critical thinking.
- ▶ Digital critical thinking concept maps is a major innovation: deserving of replication
- ▶ Collaboration is a powerful influence upon CT :new patterns of critical thinking.
- ▶ Visualization : A neglected dimension of thinking
- ▶ Generalizability of CT.

**THANK YOU
FOR YOUR TIME AND
ATTENTION.**

YOUR QUESTIONS ARE WELCOMED.



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Result from Dissertation

Student's rating of different components of 3CAM

Concept map

- ▶ Students were enthusiastic about the concept maps. **Four major themes** emerged from the student's comments on concept maps. Most of the students made supportive comments while 6 students were not satisfied with concept maps.
- ▶ The themes were visualization, organization, simplification of learning.
- ▶ "They help visualize concepts for people who are visual learners like myself"
- ▶ "They allow students to visualize their own learning as well as their peer's learning and make it easier to learn"
- ▶ "Organization of thoughts into categories more clearly"
- ▶ "Made me connect terms and learn more"
- ▶ "Not helpful, tedious and time consuming"
- ▶ For most students, this was the first-time students had a visual picture of their own thinking. Several students commented that they were visual thinkers, and concept maps were a welcomed change in their classroom learning. The vast majority of students found that the concept maps were helpful in helping them organize their thinking. The students were asked for their assessment of the use of the digital concept maps. They reported that **it took a while to get used to constructing the digital maps but once they got the hang of it, they found the digital maps to be a helpful in helping them organize their thinking.**

Critical Thinking

- ▶ They said it took them a while to be comfortable with the process but once, they became comfortable with the process they found the language games of critical thinking to help them **organize their thinking** about the content of the chapters in the text. The critical thinking questions helped them **think beyond the book and rationalize their thinking**. One student commented, **it helped them to think backwards and forward**. Another said that it **helped apply the material to the real world**.

Collaboration

- It was the best of the whole class
- I have learned a lot through collaboration
- Love it
- We shared our maps that was interesting how we think differently

Assessment

- ▶ When students were asked to assess the creation of reasoning questions, they were particularly enthusiastic. They commented that creating questions put them in the place of the instructor and having to make decisions about what are the important concepts. Another said, it eased tensions, it helped me to connect point A with point B. It gave me a chance to expand my critical thinking by taking on the professor's role a bit. It was a fun way to review the concepts. It helped me to understand the concept of the chapters. It makes me more actively engaged and think outside of the box. "I am forced to think".

Multiple Reasoning Questions

- ▶ The responses of the students were **overwhelmingly supportive**. They made the following comments:
- ▶ “Yes, because it **put us in the perspective of an instructor thinking about important concepts**, reinforces concepts, further application of the concepts gave me a better understanding of them, **makes me think critically**, it allows me **to apply my new knowledge to another platform**, I was **forced to think**” 59
- ▶ “No, didn’t take much time, tedious” 5

Link to published article

- ▶ <https://eric.ed.gov/?id=EJ1191203>